

City of Columbus
Stormwater Drainage Manual
Response to Public Comments

What follows is a summary of responses to comments received on the June 15, 2005 draft City of Columbus Stormwater Drainage Manual (Manual). Comments were reviewed by the City and were addressed through either revisions to the Manual or through the responses that follow. Comments resulting in edits that did not change the overall content or intent of the Manual are not addressed here. Comments within this category include: comments pertaining to editing-related issues, including identification of spelling and grammar errors, reference errors, citation errors, and formatting suggestions; terms and acronyms that were considered germane to the discussions presented in the Manual were added where appropriate; comments requesting additional text clarifying a subject or item, word crafting, and other related issues.

The City of Columbus would like to thank those that provided comments for contributing to the overall clarity and accuracy of the Manual. Parties who submitted comments on the City's Stormwater Drainage Manual include:

1. The Building Industry Association of Central Ohio
2. Central Ohio Watershed Council
3. Columbus Regional Airport Authority
4. EMH&T, Inc.
5. Franklin Soil and Water Conservation District
6. Friends of Alum Creek and Tributaries
7. Fuller, Mossbarger, Scott, and May Engineers
8. Mid-Ohio Regional Planning Commission
9. Mr. Domenico Milillo
10. The Nature Conservancy
11. Ohio Department of Natural Resources
12. Ohio Environmental Protection Agency
13. Oxbow River and Stream Restoration, Inc.
14. Sierra Club
15. Williams Creek Consulting, Inc.
16. Columbus Division of Transportation
17. Columbus Recreation and Parks Department

The comments are grouped under major headings with the comment authors designated at the beginning in italicized text. Since many comments from multiple authors were relevant to the same topic, it is necessary to group and address related comments under a single comment response. Comments referencing various sections or subsections of the draft Manual that pertain to the same topic are similarly grouped and addressed.

General Comments

Comment 1

(Oxbow River and Stream Restoration, Inc.) In general, examples of implementation and supporting calculations are desirable for all requirements in the CSDM.

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Response: The Manual is intended for use by those practicing professionals engaged in the design of stormwater management plans required for Building Permit compliance. The Manual includes examples of stormwater management practices that are relatively new to practicing engineers in the Columbus area. The end users of the Manual should be familiar with the application of traditional stormwater engineering practices. The Manual was not intended to serve as an instruction document.

Comment 2

(Columbus Regional Airport Authority) Add a statement that clarifies DOSD's position that it is not the intent to apply more stringent requirements than the Ohio EPA or Federal agencies with regard to stream and wetland impacts, stream and wetland mitigation, and water quality.

Response: There are instances where the City feels that requirements or criteria more restrictive than those of state and federal agencies should apply. It is the city's intent to apply more stringent requirements as needed on a watershed by watershed basis.

Comment 3

(The Nature Conservancy) Adoption by neighboring jurisdictions - The draft manual includes many concepts which would benefit stream health in other local jurisdictions. Adoption by these jurisdictions would be helpful to the overall stream network in the area and result in larger, more viable stream segments. We encourage Columbus to work with other municipalities in your service area to adopt similar stormwater protection requirements.

Response: The City has shared, and will continue to share, its expertise and experience to assist adjacent municipalities in the development of their post construction stormwater standards when requested.

Comment 4

(Sierra Club) Use manual to enhance the WWMP initiatives by:

- a. Promoting as much separation as possible of storm and sanitary flows;
- b. Not compromising quality controls in combined sewer areas;
- c. Not granting exemptions or variances which will undercut WWMP efforts;
- d. Considering requirements specific to combined areas.

Section 3.3.1.2: Stormwater Quality Control Redevelopment Variance (95) - Because redevelopment will occur in the combined sewer area, it is disturbing to reduce quality controls. Pollution reduction should be stricter, not more lenient, when there is potential for untreated discharges. This category could include any existing developed parcel in the City. The regulations are not clear but seem to suggest extensive variance availability. At a minimum, quantity controls should not be waived. And, to repeat, pollution reduction is more important on sites in the combined sewer areas.

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(*Sierra Club*) Section 3.3.7: Controls for Commercial Activity Areas and Redev. (129-133)
- Many redevelopment sites may be located in areas of combined sewage pipes. Precipitation can and should be directed to sanitary sewers if runoff collects substances requiring wastewater treatment. Other than that situation, we support keeping stormwater and sanitary sewage isolated and separate as much as possible. Public sewer pipes may be separated and the wastewater systems onsite should be designed to fit with a separate public system. It is not clear from the text as written whether 3.3.7.1 will achieve separate on-site systems or not.

Response: The Manual is not an all-inclusive development policy statement or area planning document. When the only available option is connection to a combined sewer, separate sanitary lateral and storm lateral connections to the combined sewer are required to allow for possible future sewer separation. The City does not believe it is appropriate to include more stringent requirements for the combined sewer area. Much of the stormwater discharges in the combined sewer area, unlike the rest of the City, receive full treatment at the WWTPs, including the most important “first flush”. The reduction in WQv for redevelopment areas is specified to maintain consistency with Ohio EPA variances and to encourage redevelopment within already built-out areas in an effort to reduce “Greenfield-type” development in undeveloped areas.

Comment 5

(*Sierra Club*) Encourage Reduction of Pavement De-icers - Is there any way that these regulations could move toward encouraging reduction in use of road salt and other de-icing agents? Using less road salt would do much to improve water quality in the winter/spring. See NRDC reference report Stormwater Strategies.

Response: The Manual is intended to provide design criteria for new and redevelopment projects. It is not intended to regulate the application of de-icing materials on City streets.

Introduction

Comment 6

(*Sierra Club*) Introduction (1) - According to the Columbus Department of Public Utilities 2004 Annual Report (p. 11) Columbus had 5,486 total miles of sewers: 2,782 sanitary; 2,537 storm; and 167 combined.

Response: Statistics regarding the size of the City’s sewer systems will change annually and is included in the Manual to provide perspective on the size of the City’s sewer system. A date has been added to this section that qualifies at what moment in time the total lengths of sewer were derived.

Applicability

Comment 7

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(*Sierra Club*) Applicability (1): The list of activities subject to the manual includes redevelopment of multi-family residential facilities “if the renovation will substantially affect storm water drainage.” Substantially should be removed as it is unclear. It might strengthen the intent to add something like “all private or public projects that add over 500 square feet of impervious surface or increase stormwater discharge off-site.”

Response: The term “substantially” remains in the Manual because the City is unable to provide technical justification for a numerical value limit on impervious surface.

Variances

Comment 8

(*Sierra Club*) Tighten definition for Variances - The defined terms for granting variances are loose and leave too much subjective discretion.

Response: The City rewrote the variance section to clearly identify two conditions that will be considered for variance. The conditions are that a stormwater plan has been submitted prior to the adoption of the Manual and when applicants can demonstrate that site conditions or public benefit preclude the application of Manual requirements.

Comment 9

(*The Building Industry Association of Central Ohio*) The revised manual appears to us to say that if one hasn’t obtained final engineering approval on a project before the new regulations are adopted, then the project will need to follow the new standards. This financial hardship is impractical due to many plans already in the pipeline (with preliminary plats already approved), so a more appropriate “grandfathering” mechanism is necessary to allow property owners to make land decisions based on the increased costs of these new regulations.

Response: Most stormwater quality requirements already exist under the Ohio EPA General Construction Permit for stormwater discharge since March 2003 and should already be incorporated into project designs being submitted for City review. The City’s requirements and conditions will never be less than those given by the Ohio EPA. The new regulations will strictly apply to all projects that do not have preliminary approval of a master drainage plan and all others to the maximum extent practicable.

Comment 10

(*Columbus Regional Airport Authority*) Clarify whether a variance can be obtained to allow storm sewers to replace streams in the event relocation of an impacted stream is incompatible with project and/or other regulatory requirements.

Response:

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The question is not clear regarding what may constitute being “incompatible”; however, the Variance section of the Manual was rewritten to allow variance by demonstrating that the application of this manual is impracticable because of specific site conditions

Definitions

Comment 11

(*Columbus Regional Airport Authority*) “Pre-development” is currently defined on page 7 as “the hydrologic and hydraulic condition of the project immediately before development or construction begins”. It is understood that DOSD will be changing the definition to refer to the site condition before any development took place in the final version of the 2005 Manual. Additional opportunities for public comment are requested, as this is a potentially significant modification to the 2005 Manual. Please clarify the process for determining whether a proposed project will be considered a new development or a redevelopment. Specifically indicate if stormwater controls for new developments will be based on land use prior to any development on the site. Similarly, specifically indicate for redevelopments if stormwater controls will be based on land use immediately prior to the redevelopment or prior to any development on the site. Specifically address the new development or redevelopment status for projects in which part of a site may be developed and part of the site undeveloped. Please show examples of how to apply the stormwater quality and quantity requirements in the Manual to each category of project.

Response: The City will not revise the definition for pre-development conditions. Definitions pertaining to water quantity and water quality control for new development and redevelopment are provided in the definitions section of the Manual and in Ohio EPA’s Construction General Permit Question & Answer document, now referenced in the Manual, respectively. In some instances, the City may seek to reduce increased downstream flooding problems associated with new development and redevelopment by requiring more stringent stormwater controls on upstream new development and redevelopment sites. Requiring more stringent release rates from upstream sites that are based on conditions that existed prior to any development on the site is one alternative that may be used to achieve this goal.

Comment 12

(*Sierra Club*) Definitions, Stream (8): The proposed definition of a stream includes a surface watercourse with defined bed, bank, and high water mark. It is not the same as the definition in Appendix A, the Columbus Erosion and Sediment Pollution Control Regulation¹. The definition also differs from that agreed on by the Big Darby Environmental Advisory Group.²

¹ “Stream: a body of water running or flowing on the earth’s surface or channel in which such flow occurs. Flow may be seasonally intermittent.”

² “The definition of a stream requiring protection is defined as a perennial, ephemeral or intermittent stream with a defined bed, bank, or channel. NRCS maps should be used as one reference and the presence of a stream requiring protection should also be confirmed in the field.”

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The definition also differs from that in EnviroScience Environmental Planning and Zoning; Sample Environmental Zoning Tools.³ We advocate removing the requirement for a high water mark, which would bring it closer to the other definitions cited. Streambank should also be defined. Specifying reference maps would enhance the definition.

If the presence of a high water mark is required for the proposed Stormwater Manual, then a reference for the definition should be included. In any case, the definition should include the distinction between Tier I and II.

See comments on definition of stream: we do not support the requirement for a high water mark. Intermittently flowing water in a bed and bank should be sufficient. Possible reference maps, in addition to USGS topo quads, include FEMA maps, county riparian maps, or soils maps.

(Franklin Soil and Water Conservation District) Streams Definition should be generally described as any watercourse having a defined bed and bank or any previously tiled waterways that currently have been “day lighted” and have developed a bed and bank or any constructed ditch or other watercourse having a bed and bank that is not a part of the road right-of-way drainage system as a whole. Any of the following resources may provide limited but suitable documentation of streams.

- a. All permanent, intermittent or ephemeral streams;
- b. USGS topographical map streams;
- c. Watercourses defined under the City of Columbus Hellbranch Overlay Ordinance;
- d. Watercourses shown on USDA/NRCS "Soil Survey of Franklin County" maps, and as updated by the Franklin Soil and Water Conservation District Drainage Mapping Project;
- e. Ohio Environmental Protection Agency headwater streams;

Response: Reference to the existence of an ordinary high water mark has been removed from the stream definition. The distinction between Tier I and Tier II streams is that Tier I are readily identifiable as blue-line streams on a USGS 7.5 minute quadrangle map. Tier II streams may or may not be shown on USGS 7.5 minute quadrangle maps and, therefore, require field location/verification.

Comment 13

(Sierra Club) Part I – Stormwater Policy and Facility Design Criteria (11) - This outline overview of stormwater conveyance and controls presents questions, especially when compared to the definitions on pages 8 and 41:

³ “A surface watercourse with a well-defined bed and bank, either natural or artificial, which confines and conducts continuous or periodic flowing water in such a way that terrestrial vegetation cannot establish roots within the channel. Further, a stream must appear on at least one of the following maps: USGS topographical map, County Riparian Setback map, or soils maps located in the Soil Survey for the County, Ohio, USDA, or NRCS.”

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- a. Why does “Minor Stormwater Conveyance Systems” include certain components and not others? It is surprising that it does not include drainage swales, curbed streets, and open channels. Why does it include end treatments, outlet channel protection, and level spreaders?
- b. Why does “Major Stormwater Routing Systems” only include open watercourses? Why does it not include streets and floodplains?
- c. Why does “Stormwater Quantity Controls” not include swales, pervious pavement, filter strips, stream corridors, or natural systems to control quantity?

Response: Open channels have been added to minor conveyance system list. Curbs are already listed as acceptable minor conveyance systems. Open watercourses were removed from the major conveyance list to avoid perceived exclusion of other flood routing infrastructure. A better and more complete description of major flood routing facilities is provided in Section 2 where this topic is discussed. The facilities referenced in this part of the Manual are for constructed quantity control facilities that are capable of providing flood control for storms up to and including the 100-year event; although the features listed may provide some quantity attenuation for more frequent storm events, they are either natural features that are not constructed or are not capable of controlling runoff from larger storms.

Stream Corridor Protection

Comment 14

(The Building Industry Association of Central Ohio) Section 1.2 - The second paragraph apparently places the City in the position of identifying streams and wetlands. In meetings last November, industry representatives explained that the Corps of Engineers is the only governmental authority that can approve wetland/stream delineation. However, this section allows the City “final identification”? Under what authority does the City have the power to make this determination? Why does the City feel like they need to have the ability to override the regulatory authority of the Corps of Engineers, and who is the in-house expert that would be able to make this determination?

(Sierra Club) There needs to be verification or check through an independent source, not just at the discretion of the Director. The Applicant carries the responsibility to identify streams, but has a strong interest to not find them. Stream identification should include the Soil and Water Conservation District.

Response: Under this regulation, the City has determined the definition of Tier I and Tier II streams. The Corps of Engineers is the authority for determining if any proposed impacts are to waters of the state or “jurisdictional” waters. Text in Section 1.2 has been revised to state that the City may require a site inspection and input from other sources of information including the U.S. Army Corps of Engineers, Ohio EPA, ODNR, or an appropriate Soil and Water Conservation District to assist in the classification of Tier II streams. The Director or designee will make the final determination relative to whether or not an open channel fits the definition of a Tier II stream subject to the stream protection policy.

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Comment 15

(*EMH&T*) Section 1.2, page 13: in the second paragraph, the first sentence should be deleted. Given other language in this section of the manual, there does not appear to be a need for referencing wetland vegetation as an indicator of the presence of a stream channel.

(*Sierra Club*) Appendix B should not be used to identify streams or wetlands. Lists of riparian species would be more useful for streams in natural conditions; wetland lists for wetlands. If the site has been altered and degraded, however, a stream may exist without its expected species.

Appendix B must not be used to identify streams. It is not an adequate or complete list of stream or wetland vegetation. A commonly accepted authoritative reference should be used: US Fish and Wildlife List of Wetland Plants is suggested since a stream will show riparian species, and not necessarily wetland plants.

Response: The use of vegetation in Appendix B to indicate the existence of a stream has been removed from the Manual. The definition of a Tier II stream has been simplified to require the existence of a defined bed and bank only.

Comment 16

(*Sierra Club*) Section 1.2: Stream Identification (13): Some protection is granted to streams, none to “open channels.” There is no definition of an open channel. Distinguishing between a stream and open channel can be difficult. More guidance is needed. We suggest articulating the principle that watercourses do not qualify for protection if they are constructed features and were not previously existing stream channels.

Response: The definition of constructed open watercourses has been modified to read:
Constructed Open Watercourse — *Constructed drainage channels that confine and conduct a periodic flow of water in such a way that concentrates flow. For the purposes of this Manual, constructed open channels include swales or ditches that are constructed to convey stormwater runoff within development sites and along public and private roadway systems.*

Comment 17

(*Franklin Soil and Water Conservation District*) Preferred Mapping Resource and Graphical representation of streams as defined for administrative purposes should incorporate the highest resolution of the above listed resources in a common map, available in hard and electronic form for all jurisdictions. The map should be recognized by all jurisdictions as the prime determiner of buffer width. A central and multi-jurisdictional entity such as the Soil and Water District or other qualified entity should verify or arbitrate in situations where challenges or discrepancies between the map and landscape.

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Response: The City agrees that a map with accepted stream locations would be helpful in the location and identification of streams in Central Ohio. The development of such a map, however, is outside the scope of the Manual.

Comment 18

(Sierra Club) Update Stream Corridor Protection Zone - The formula for this protection zone should be updated to the latest ODNR Rainwater and Land Development formula. Also, it should include the 100 year floodplain, wetlands, and steep slopes.

(Franklin Soil and Water Conservation District) Riparian Setbacks by definition should include a hydrologic component (streamway) and nonpoint source filtration/terrestrial habitat component (minimum undisturbed vegetated corridor).

- a. Streamway should be calculated using the ODNR/Ward formula and should encompass the entire floodway and 100-yr floodplain or the calculated streamway width, whichever is greater. Streamway/Setback should meet or exceed the 1:10 bankfull width to floodplain width ratio as described by Dr. Ward. Streams with drainage areas of less than one square mile should have a minimum 120 foot streamway width in accordance with formula.
- b. Undisturbed Vegetated Corridor should be between 150 and 300 feet or wider per stream bank regardless of floodplain location. It should never be less than the floodway width. Existing woodlots and wetlands adjacent to any stream should be incorporated into the setback area. Wetlands require a 50-foot setback as part. Streams with drainage areas of less than 1 square miles should have a minimum vegetated setback of 60 ft per side.

(Mid-Ohio Regional Planning Commission, Sierra Club, The Nature Conservancy) - The Ohio Department of Natural Resources has updated the equation for the meander belt width plus two channel widths to: $129 (DA)^{0.43}$ (page 15 reference- please update) Ref: ODNR Rainwater & Land Development Handbook May 2005 Draft. Chapter 2 Stormwater Management Practices page 21.

(Mid-Ohio Regional Planning Commission) Table 1-1 (page 15): a 200 foot stream corridor protection zone width does not seem adequate for larger rivers such as the Lower Big Walnut Creek, drainage area 117.8 m² which has a stream corridor protection zone width of 1,002 feet according to the new calculation, 909 feet according to the old calculation used in the Manual. Please consider readjusting Table 1-1 to include another tier of drainage area > (greater than) 20 square miles (12,800 acres) = 500 feet (approximately 220 feet each side). The current cap outlined in Table 1-1 only reaches 2,000 acres which is only 3.13 square miles- a small stream such as Hayden Run has a larger drainage area than that (5 square miles).

The Stream Setback Zone should be extended to include the floodplain fringe (100-year floodplain) as recommended in the Rainwater & Land Development Handbook (draft May 2005).

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Response: The calculated widths and associated tributary areas provided in Table 1-1 were adapted from ODNR/Ward formulae and have been revised to reflect ODNR's current 129 multiplier. The Division of Sewerage and Drainage (DOSD) is aware of the storage benefits provided by the 100-year floodplain and prohibits filling within them without compensation. DOSD did not include the entire 100-year floodplain in the Stream Corridor Protection Zone; however, made provisions for protection of flood storage volume. The protection of wetlands and steep slopes adjacent to stream channels are already provided in Section 1.

The City consulted many references and resources to determine adequate buffer sizes and widths for stream protection. The City chose to adopt the calculated buffer widths proposed by Dr. Andy Ward and ODNR because this methodology is more scientifically based on regional curve data for stream meander widths. After consultation with the Stormwater Advisory Group that assisted the City with the development of the Manual, and review of available reference materials, including design manuals and stream corridor protection ordinance of other communities, the City elected to limit the maximum Stream Corridor Protection Zone width to 200 feet. The maximum width has been revised to 250 feet based on ODNR's latest 129 multiplier. The buffer widths provided for in the Manual are expected to remain undisturbed and vegetated.

Comment 19

(*Sierra Club*) Section 1.3: Stream Corridor Protection Zone (15) - Establishing stream corridor protection zones is a very positive approach. The methodology could be improved:

- a. If stream is Exceptional Warmwater Habitat, formula should be more generous: Width in feet = $133 DA^{0.43}$ See Ohio EPA, TMDL for the Big Darby Creek Watershed (May 16, 2005)
- b. The Stream Corridor Protection Zone must include wetlands. This report specifies in Section 1.5 that the zone expands to include contiguous wetlands. That requirement needs to be included here for completeness.
- c. The protection zone is defined as expanding to include slopes of more than 15%, up to double the protection zone. We advocate, instead, for full inclusion of all slopes 12% or more.⁴ This would prevent erosion-causing activities on steep slopes and consequent loss of sediment into watercourses. Ideally, there would be a setback from the top of the slope of 10 feet.

(*Franklin Soil and Water Conservation District*) Steep Slopes (>15% grade and any NRCS-designated HEL soils) should not be considered towards the minimum buffer width. A minimum of 50 foot additional setback should be allowed beyond the top of the slope regardless of whether horizontal distance to top of slope meets or exceeds the minimum 120 foot undisturbed setback requirement.

Response: The Introduction of the Manual has been revised to acknowledge that other agencies, including the City and Ohio EPA, may require more restrictive stormwater

⁴ See EnviroScience, Natural Resource Zoning p. 108 definition of steep slope.

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standards in specific areas of the City to which the Manual would apply. In such instances the more restrictive criteria would govern. Section 1.3.1 of the Manual has been revised to reference the wetland protection requirements in Section 1.5.

Given the complex and numerous variables associated with slope failure incidents and the varying site conditions that are likely to be encountered throughout the City, it is not possible to technically justify nor establish an accurate “one-size fits all” setback distance along the top of a slope to prevent structural losses during a slope failure. The City consulted with Franklin Soil and Water Conservation Service early in the development of the 15% slope threshold. Research conducted by the City on this topic has not yielded enough technical justification to reduce the minimum protective slope value from 15% to 12%.

Comment 20

(Mid-Ohio Regional Planning Commission) Page 16: “The developer shall identify on the plat or plan and visibly delineate on the site the stream corridor protection zone prior....” Please consider adding language such as “It is recommended that the stream corridor protection zone be marked with split rail fencing / sign posts where property turns, every 150 ft or at every property line- whichever is the least distance. These need installed before construction of the site begins”.

Response: The developer will be required to clearly field mark the boundary of the stream corridor protection zone. Use of permanent fences or signs may not be compatible with the developer’s improvement plan, particularly where the zone will lie on private property. The requirement of the developer to delineate the zone before construction is already provided in Section 1.

Comment 21

(Franklin Soil and Water Conservation District) Mitigation and Pre/Post Construction Management and Policy should include the identification of areas suitable for stream channel and habitat restoration, systematic re-establishment of usable floodplain elevations through floodplain lowering where appropriate and feasible, and the establishment of perpetual conservation easements should be prioritized or other legally binding and enforceable set-aside should be prioritized.

Response: The City’s Stream Protection Policy is written to provide perpetual protection. The Manual is not a planning document for such purpose as establishing procedure for potential restoration projects. Although there may be future applications for stream restoration, full text and plans for stream restoration projects design is beyond the scope or purpose of the Manual.

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Comment 22

(Franklin Soil and Water Conservation District) Conservation easements should be considered rather than maintenance easements in stream corridors or promotion of these by incentives.

Response: Restrictions within the Stream Corridor Protection Zone are not written in the form of maintenance easements but are referenced directly on the plat and reflected within the deed.

Comment 23

(The Building Industry Association of Central Ohio) Section 1.3 - Will the City maintain all SCPZ? Will Parks department accept this area as parkland dedication?

Also, the manual states that the SCPZ can be used in density calculations. Has the planning department agreed to this determination?

Response: Stream Corridor Protection Zone is to be left in natural state; it is not expected that maintenance beyond occasional removal of stoppages will be necessary. Recreation and Park may accept up to 25% of the Parkland Dedication area as a Stream Corridor Protection Zone. The Planning Department has reviewed the proposed language pertaining to density calculations and is in agreement with that language.

Comment 24

(Sierra Club) Table 1-2: Prohibited Facilities and Activities (17) - Prohibited facilities should include roads, driveways, parking lots, and man-made impervious surfaces, quarries, road salt storage, and storage tanks. Prohibited activities could be clarified by listing dredging and filling.

Response: Parking lots have been added to the prohibited facilities list in Table 1-2. The City considers dredging and excavation to be the same. Excavation and filling are already listed under the prohibited activities list in Table 1-2.

Comment 25

(EMH&T) Section 1.3.4, page 17: We suggest a reference to constructed stormwater outfalls as being a permissible use within the Stream Corridor Protection Zone (SCPZ). It is understood that the outfall constructed within the SCPZ should be an open channel or swale, not an enclosed storm system. We also suggest that activities related to enhancement of existing wetlands within the SCPZ be listed as a permissible use, as long as they do not constitute a prohibited activity. Also, it may be appropriate to mention the possible necessity for a permit from the Corps of Engineers (and Ohio EPA) for certain activities that would impact the stream channel, such as stream crossings.

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Response: Section 1 has been revised to accurately state that no piped outfalls are permitted within the Stream Corridor Protection Zone except for in extreme cases. Enhancement of existing wetlands has been added to the permitted uses.

Comment 26

(*EMH&T*) Section 3.2.1, page 82: This section mentions the possibility of regional stormwater detention basins; however, there does not seem to be any specific criteria for an “on-line” regional detention basin in section 3.2.4, nor any allowance for this in the permissible uses within the SCPZ. We suggest clarification on whether any new facilities of this type would be permitted.

Response: Online regional detention basins would be prohibited within the Stream Corridor Protection Zone for two reasons.

- a. Conveyance of uncontrolled runoff to the regional facility through an existing stream would likely result in increased streambank erosion and stream degradation, and
- b. Disturbances within the zone to construct the facility would result in loss of habitat that the Stream Corridor Protection Zone is designed to protect.

Regional stormwater detention basins constructed outside of the Stream Corridor Protection Zone and FEMA designated 100-year floodplains will be permitted.

Comment 27

(*Franklin Soil and Water Conservation District*) Compatible Uses for floodplain areas may include limited agriculture and livestock, passive recreational uses, and minimal structures associated with passive recreations that do not increase the level of imperviousness within the 100-year floodplain. In all cases the 120-300 foot undisturbed riparian setback should be maintained and necessary management and BMP’s on agricultural land and other uses should be installed.

Response: The stream protection requirements in the Manual are written to apply to new and redevelopment projects, not agriculture or other existing landuses.

Comment 28

(*Sierra Club*) Section 1.3.5: Exemptions (18):

- a. Even in the downtown zoning district, there should be a protected corridor along the Scioto and Olentangy rivers.
- b. The exemption involving the floodwall is not clear, but appears to not extend west of the floodwall. This exemption could be dangerously large. What about tributary streams that run west toward the Scioto?
- c. We suggest incentives to reduce building in the protection zone – thus disincentives to leaving buildings in the protection zone.

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Response: The City considers the requirement for protected corridors within the downtown zoning district to be too restrictive since riverfront areas within this area are already heavily developed and impacted. The exemption states that the Stream Corridor Protection Zone ends at the river-side face of the floodwall or floodwall easement. It is important to note that the area within the floodwall boundary is nearly completely built out; therefore, since the line of protection cannot be breached, the area is and has been unavailable for floodplain storage for many years. Streams tributary to the Scioto River that are not located within the downtown zoning district, will have a Stream Corridor Protection Zone based on their respective tributary area or floodway width as specified in Section 1. Incentives and disincentives are beyond the scope of the Manual. Exemption 3 was written to encourage redevelopment by reducing restrictions on the Stream Corridor Protection Zone where buildings are already located within the zone. The City's position to encourage development in areas that are already impacted by development reduces impacts to the environment in other green-field areas.

Floodplain Compensation

Comment 29

(The Building Industry Association of Central Ohio) Providing compensated volume for fill in the floodplain will make some properties that can't be developed and others will be impacted by losing density. There is a need for the ability to compensate floodplain fill by adding volume in detention basins adjacent to the floodplain or SCPZ.

(Sierra Club) Section 3.1.2: General Criteria for Stormwater Control Facilities (81-82): We do not support siting of control facilities in the floodplain.

(EMH&T) Section 3.1.2, page 81: this section allows for placement of at least a portion of a stormwater detention basin within the 100-year floodplain. We suggest clarification on whether there will be any restrictions on any portion of the designed storage volume being at or below the 100-year flood elevation? When determining the required compensation for fill within the floodplain associated with a detention basin, does the volume of storage used in the basin for on-site stormwater management constitute loss of floodplain storage?

Response: The City will not allow floodplain fill compensation in detention basins for stream side sites for the following reasons:

1. Fill compensation within detention basins is typically accomplished by allowing backwater from flood flows to enter the basin through the basin's outlet pipe. The theory is that the pool in the basin and water surface in the channel will stabilize to the same elevation once flood flows have enough time to enter the basin. The problem with this concept is that the outlet pipe acts as restriction causing a delay in the time it takes for the water in the channel to reach the basin.
2. As written the policy requires compensation between the ordinary highwater mark and the existing flood elevation where basins are more likely to be full from onsite

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stormwater flows leaving little room to provide adequate storage for additional flood flows within the channel.

3. Compensation within detention basins does little or nothing to offset increased velocities within the channel when conveyance for floodwater flows is reduced by the proposed fill.

The City recognizes, however, that there may be instances where the stream bank is not within the limits of the property but portions of the site may still be located within the floodplain. The City will consider allowing fill compensation along other reaches of the stream that are not necessarily located on the property on a case-by-case basis. The floodplain compensation requirements in Section 1 have been expanded to allow offsite mitigation. Section 3 has been revised to prohibit the location of stormwater control facilities within the 100-year floodplain. It is the City's position that the operation of such facilities are likely to be compromised if their available storage capacity to control onsite flows is displaced by flood waters within the 100-year floodplain that are able to migrate into the stormwater control facility.

Comment 30

(*Sierra Club*) Increase Protections for Floodplains - This manual allows the continued practice of floodplain filling. Too much floodplain filling has already occurred and it should be stopped. We do not support sighting (SIC) stormwater control facilities or mitigation wetlands in floodplains (or stream protection zones).

Section 1.4: Floodplain (18-19):

- a. We do not support filling or dredging in the 100 year floodplain and suggest removal of permission in this manual and from the Columbus Zoning Code Flood Plain Development. City policy should not give incentives for (more) filling of floodplains. Even if compensatory volume of space is provided for floodwaters, dumping in floodplains introduces foreign materials with possible biological and chemical contaminants and alters the hydrology. By its nature, floodplain filling and excavating greatly disturbs drainage patterns. Filling of floodplains should not be compensated through disturbance of stream corridor protection zones or construction of upland detention basins.
- b. We question the need to have stream restoration plans designed and signed by a professional engineer. Restoration specialists and landscape architects know stream restoration better.

Response: The manual does not grant permission to fill designated FEMA floodplain areas. The criterion in the Manual seeks to prevent the potential for increased flooding downstream due to loss of local floodplain volume. The City does not support the compensation of floodplain volumes in upland detention basins and has revised Section 1 to allow offsite mitigation in lieu of this alternative. Additionally, Section 3 has been revised to prohibit the location of stormwater control facilities within FEMA designated 100-year floodplains. ODNR recommended, and the Stormwater Advisory Group agreed, that allowing disturbances within the Stream Corridor Protection Zone to maintain or reconnect the

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floodplain to the main channel is more beneficial to the stream because doing so reduces velocities within entrenched channels and reduces streambank erosion and channel downcutting. Stream restoration is a multidiscipline specialty that involves not only knowledge of horticulture and landscape architecture but also an understanding of channel hydrology, hydraulics, shear stress analysis, and fluid dynamics. The City is not aware of any publicly recognized, accredited, registration program that certifies stream restoration specialists as a stand-alone discipline. Section 1 has been revised to clarify that restoration plans are a part of the normal submittal that must be signed by a licensed Professional Engineer.

(Franklin Soil and Water Conservation District) Page 18, the word “discouraged” in regards to floodplain compensation should be changed to “prohibited.”

Response: The floodplain preservation requirements in Section 1 have been revised to prohibit floodplain fills without compensation.

Comment 31

(Franklin Soil and Water Conservation District) Page 19 should give a time frame for mitigation of disturbances to stream corridor protection zone. Possibly 3 days after completion.

Response: Ohio EPA’s construction permit for construction adjacent to a stream, requires appropriate sediment controls during construction, temporary stabilization if construction inactive for 21 days, and re-vegetation within 2 days following establishment of final grade.

Comment 32

(Sierra Club, Central Ohio Watershed Council) Add Incentives for Stream Restoration - A policy of restoration could be advanced by this manual, providing incentives for improving hydrologic and biological functioning of streams. There need to be incentives for stream restoration. Stream restoration must have its own section in the manual. At present it is scattered under compensation for floodplain filling in Section 1.4 and Section 2.3.7.

(Franklin Soil and Water Conservation District) Stream restoration to handle some storm water volume. Natural or 2-stage design bioengineering and geomorphology should be considered. Consider referencing Stream Corridor Restoration handbook by USDA on principles, processes, and practices.

Response: Reference to restoration is as a permitted activity. The manual is not a planning document for purposes such as establishing procedure for potential restoration projects. Full text and plans for stream restoration project design is beyond the scope or purpose of the Manual. Stream restoration using bioengineering/geomorphology is required to mitigate permitted disturbances within the Stream Corridor Protection Zone. The USDA handbook is already referenced.

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Wetland Policy

Comment 33

(The Building Industry Association of Central Ohio) Section 1.5:

- a. As wetland and stream fill permitting with the Corps of Engineers and Ohio EPA is often a concurrent process with plan development, we don't often have the permits at the time the stormwater management report is submitted. This requirement should be changed to require copies of applicable permits prior to approval of the stormwater management report.
- b. Our position regarding the City's involvement in wetland protection is the same as our position regarding Section 1.2; our industry currently is required to comply with difficult wetland and stream permitting requirements at the federal and state level, and imposing local regulations that are not consistent with these requirements is not appropriate.

Response: Section 1.5 requires that the permit applications be submitted with the Stormwater Management Report, not the actual permit. The manual does not impose requirements that are inconsistent with or contrary to the Corps or Ohio EPA. The City encourages the mitigation of disturbed natural features as close to the site as possible. It is well documented that the loss of natural wetlands and streams results in increased flooding, erosion, and the degradation of water quality in downstream areas. Mitigation for stream or wetland losses outside of the watershed, as permitted by the USACE and Ohio EPA, does not compensate for the loss of these natural features within the same watershed.

Comment 34

(Sierra Club) Strengthen Protections for Wetlands - This can be accomplished by:

- a. Clearly including adjacent wetlands in the protection zone;
- b. Adding easements or buffers around high quality wetlands;
- c. Adding penalties for disruption or destruction of wetlands;
- d. Strengthen the stated goals of preserving wetland hydrology.

Section 1.5: Wetland Protection (21):

- a. We support the policy of protecting wetlands through delineation and inclusion on the plan and report, extending the stream corridor protection zone to include wetlands, and mitigation as close as possible. We do not support allowing constructed mitigation projects in the stream corridor protection zone.
- b. Language in this section would be clarified by specifically requiring:
 - preserve pre-development quantity and quality of wetland stormwater
 - don't use existing wetlands to treat development stormwater
 - post-development flow to wetland should not be increased
- c. There should be penalties or consequences for violating wetlands. As written, the rules are aspirational and offer no incentive to truly protect existing wetlands from the altered hydrology of development.

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(Mid-Ohio Regional Planning Commission, Franklin Soil and Water Conservation District)
Wetland Protection Policy: we recommend setbacks from wetlands be included. Follow the guidelines within the ODNR Rainwater & Land Development Handbook (draft May 2005). Chapter 2 Storm Water Management Practices page 17-18.

(Central Ohio Watershed Council) "...wetlands need protection so these important features can provide the twin functions of reducing peak flow and improving runoff quality. Some clarification for wetland protection is suggested. For example natural or existing wetlands should not be identified for additional storm water treatment, an existing wetland can help reduce pollutants but routing additional storm water through an existing wetland would void the benefits.

Response: Protection for adjacent wetlands is provided in Section 1. The wetland protection requirements presented in this section are intended to enhance the protection of existing streams by preserving the immediate flood storage and water quality benefits that streamside wetlands provide. Section 1 and Section 3 of the Manual require quantity and quality controls for stormwater runoff prior to discharge into a natural wetland system. Enforcement of wetlands that exist within the Stream Corridor Protection Zone is provided within the Columbus City Codes Section 1145. The City believes that the reasons for wetland protection are adequately stated.

Conveyance – General Criteria

Comment 35

(Domenico Milillo) Page 24:

- a. First paragraph - Overland flows paths are now being limited to 150 feet (Maryland and Pennsylvania advocate 100 feet maximum). Post development sites use 50 feet in the Lag Equation.
- b. Second paragraph sets the theme of this manual and as stated it implies that all flows, regardless of frequency, the post flows shall be managed to pre-development flows. This implies that multiple orifices and /or weirs shall be designed at the principal spillway and the emergency spillway for the 100 year frequency. This is quite extraordinary in that most management set the maximum flow to the principal spillway as 10 or 25 post - development, with multiple orifices to discharge the 2, 5, and 10 pre-development flows, storage is from 10 to the 100 year frequency with the emergency spillway or flow at the 100 year stage.

Response: Section 2 has been revised to provide acceptable limits of the lengths of overland flows paths based on surface condition.

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Comment 36

(Oxbow River and Stream Restoration, Inc.) The 10% rule should be supported in the CSDM with explanation and examples of computation.

Response: The 10% guideline requires that detailed watershed studies be performed for each successive development in the watershed in order to estimate how post development flows are routed to the 10% point downstream. Such studies are cumbersome and expensive as they require each control structure along the watercourse must be surveyed and simulated in the watershed model. Additionally, many stream reaches are in private ownership making access for surveying activities challenging. The City considered the 10% guideline as a condition of downstream analysis, but opted to restrict downstream flows such that no increase in water surface elevation is permitted within the downstream limits specified in the Manual. In addition to this criterion, development controls must also meet the Ohio EPA/ODNR-based water quality volume and drawdown requirements, and the Critical Storm quantity control requirements specified in the Manual. The City feels that the combination of these criteria will mitigate for changes in stormwater runoff from development.

Comment 37

(Sierra Club) Section 2.1: Stormwater Conveyance (23-24) - Controls seem to require that offsite and onsite runoff will not increase peak stormwater rates - not increasing downstream peak water surface elevation?

Response: The Manual states that the combined onsite and offsite flows cannot increase downstream water surface elevations. The control requirements are indeed based on peak flow reduction. If an analysis of the downstream system shows an increase in water surface elevation with quantity controls in place, however, the onsite control facility must be redesigned to restrict more flow to meet the water surface elevation restriction.

Comment 38

(Sierra Club) Section 2.1.5: Stormwater Diversion (25-26) - The process of approval and criteria is unclear. The requirement for diversion from one catchment to another is low and the decision discretionary. We suggest setting the bar higher and making requirements more specific.

Response: The decision has always been discretionary in Ohio law; however, the City is presenting requirements that define under what conditions diversions may take place. The process for approval is for the professional design engineer to clearly state that in addition to being no adverse impacts from the diversion there are *benefits* and to describe same.

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Hydrology Requirements

Comment 39

(*Domenico Milillo*) - Page 26 Section 2.2.1 - The Rational Method (The Modified Rational Method) is now used extensively in developing runoff hydrographs. According to Ben Urbanos and Peter Stahre in their publication "Stormwater Best Management Practices and Detention for Water Quality, Drainage, and CSO Management" (1993), state that "the superficial Rational Method Formula-Based Method estimated a volume of 2%+/- of the volume found using the exact calculating methodology as compared to Hydro-Pond and UDSWW2-PC.

(*Sierra Club*) Section 2.2.4: It would be much clearer if the manual relied on one hydrograph method and included the necessary information. See Portland Stormwater Management Manual Appendix B, Santa Barbara Urban Hydrograph Method.

Response: The use of the Modified Rational Formula is not excluded. There are many methods that can be used to generate runoff hydrographs and the Manual acknowledges this fact by allowing the use of other equivalent methods if supported by proper documentation and a demonstrated record of successful application for drainage system design. The unit hydrograph methodology is presented in the Manual because its concepts are familiar to local engineers and staff and has long been an accepted methodology used by the City and other federal, state, and local agencies.

Comment 40

(*Domenico Milillo*) - Page 28 - The writer should make it very clear that the IDF curves should be used strictly with the Rational Method.

Response: The IDF curves are not only applied to the Rational Method. The IDF curves are also used to determine water quality flow amounts for flow-through treatment practices serving less than five (5) acres and can be used to determine 24-hour precipitation volumes.

Comment 41

(*Domenico Milillo*) Page 31 - The minimum time of concentration should be 5 minutes rather than 10 minutes (see attachment where TR55 calls for 0.1 hour "6min.", however 5min. is widely used). The overland flow equation should include the Manning's Kinematics Equation:

$$T=0.007(nL)^{0.8}/(P^{0.5})(S^{0.4}) \quad S=\text{slope in ft/ft}$$

Again the maximum length is 150 feet.

Response: The Manual has been revised to reduce the minimum time of concentration to 5 minutes in order to maintain consistency with the minimum 0.1 hour criteria specified in TR-

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55. The Manual has also been revised to require the use of the kinematic equation to calculate overland flow times.

Comment 42

(Domenico Milillo) Page 33 Soil Variables - The statement at the end is very restrictive; it is a slap on designers that do good professional work. I would state this: Use extreme caution when determining the HSG for the developed watershed. The HSG can change drastically. It does not necessarily have to be the same for both undeveloped and developed conditions. During a mass grading operation the permeable upper layers of soil can be removed, often leaving the impermeable subsoil horizons exposed. The same situation could occur by manipulation and compaction of the different soil horizons. Note that Group D soils' infiltration rates range from 0 to 0.05 in/hr, (considered impervious).

Response: The Manual has been revised to advise designers to consider the impacts of construction activities on native soils when performing post construction runoff calculations. The City agrees that reclassifying all altered onsite soils into a single hydrologic soil group is not technically justifiable. The City has therefore, removed the post-construction Group D classification requirement.

Comment 43

(Domenico Milillo) Page 34 Rational Method:

- a. The most current equation has a frequency correction factor as follows:

Return Period (years)	C(f)
2-10	1.00
25	1.10
50	1.20

- b. Regression equations are too simplistic, I would continue with TR55 and TR20.

Response: The Manual text and runoff coefficient table have been revised to specify the use of correction factors with the Rational Method. The City supports the use of the Regression Equations, especially with regard to the design of transportation related facilities along streams. The regression equations referenced in the Manual were developed by the United States Geological Survey based on observed stream data in Ohio. The use of regression equations to predict flow in streams has been adopted by the Ohio Department of Transportation and is presented as an acceptable methodology in the Urban Drainage Design Manual, 2001 (HEC No. 22) developed by the Federal Highway Administration.

Storm Sewers

Comment 44

(The Building Industry Association of Central Ohio, Fedner) Section 2.3.1 - The City currently requires a 2 year design and a 5 year check for residential subdivisions. However,

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the manual proposes that this criterion is valid only for local streets, and that collector streets will need to be designed to a 5 year design storm / 10 year check. Since collector streets are typical in residential areas, this is not practical within a subdivision where you may have a local street storm sewer system connecting to a collector street system, and routing back through another local system. In addition, the building industry is strongly opposed to this design change for collector streets due to the obvious cost implications.

Response: The design level of service requirements for storm sewer systems has been increased since the June 2005 publication of the draft Manual based on criteria recommended by the Federal Highway Administration, the Ohio Department of Transportation, and the City's Transportation Division to increase safety for vehicular traffic on city roadways. Factors that influence the increase in level of service include the design speed and volume of traffic under which the roadway is expected to operate. Where the same storm sewer system serves roadways with different functional classifications, storm sewer runs that receive flow from upstream storm sewers that serve roadways with higher classifications shall be designed to convey runoff from the larger design and check storms associated with the highest classification served by the upstream sewer system.

Comment 45

(Domenico Milillo) Page 43 Pipe Sizing Criteria: The last sentence " In addition, all storm sewers larger than 72 inchesduring the 25-year storm." Needs further explanation.

Response: The differing check storm criterion for storm sewers 72 inches and larger was carried over from the current edition of the City's Stormwater Drainage Manual. After further consultation with City staff, the City is unable to provide technical justification for the continued use of this criterion. The Manual, therefore, has been revised to remove this requirement.

Comment 46

(Domenico Milillo) **Hydraulic Grade Line and Minor Loss Considerations**

I believe that the writer should leave this to the designer and his expertise on same. I fail to understand why the most important losses (major losses) are not mentioned and as well as the Energy Grade Line (EGL). The HGL is nothing more than the pressure energy and since the fluid is the same it is assigned a value of 0 in the Conservation Of Energy Analyses (Bernoulli's Equation). EGL is more important in that it reflects the velocity head (kinetic energy) that is added to the HGL. Major losses are friction losses against the sides of pipes and/or channel and these appear in the recommended Storm Sewer Check Sheet at the end of manual column $H_f = S_f L$. A brief presentation of the principal of Conservation of Energy would do more justice to this important section of hydraulics.

Response: The Manual was revised to provide more information and detail in the discussion of major hydraulic losses and how they are accounted for in the determination of hydraulic

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grade line (HGL) elevations. For the purposes of storm sewer design within the Manual, focus is given to the HGL as it represents the true water surface elevation within (non-pressurized) locations (structures) between each storm sewer run. While the City agrees that designers should be knowledgeable of conservation of energy principles and pressure flow hydraulics when designing storm sewer systems, the Manual is not intended to serve as an educational resource on these subjects.

Comment 47

(Domenico Milillo) Page 46 Table 2-11 - The minor losses listed are just a very few of the many losses that are listed in various hydraulics' publications.

Response: Table 2-11 lists minor losses are losses that are commonly accounted for in storm sewer design and is not intended to be all-inclusive. The Manual has been revised to state this fact.

Comment 48

(Domenico Milillo) Section 2.3.1.3 second paragraph - Why only three types of pipes? How about: Corrugated steel pipe, metallic coated, Corrugated aluminum alloy pipe, Coated corrugated galvanized steel pipe, Corrugated polyethylene (PE) pipe, Polyvinyl chloride (PVC) pipe, and Acrylonitrile-butadiene styrene (ABS) pipe?

Response: A reference to acceptable pipe materials as provided in the City of Columbus Construction and Material Specifications has been added to the Manual. Some of the materials suggested in this comment are not presented in the Construction and Material Specifications as acceptable pipe materials.

Comment 49

(Domenico Milillo) Page 63 Manning's "n" Values - With so many publications on this subject it is imperative that this manual do justice to this extremely important parameter. Section 2.3.1.2 should be revised as well.

Response: The Manning's "n" value of 0.012 presented in the Manual is suitable for accepted pipe materials for storm sewers and accepted smooth-walled pipe materials for culverts. Reference to the Manning's "n" values for corrugated metal pipes found in the Ohio Department of Transportation's Location and Design Manual, Volume II has been added to the Manual.

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Culverts

Comment 50

(Domenico Milillo) Bankfull Design Consideration - The last sentence in first paragraph "If significant changes in water surface elevation are determined, larger pipe sizes and/or alternative pipe shapes shall be used to reduce the impact." This statement is not correct. If discharges from a designed culvert exceed the bankfull elevation, which is most always to be the 2 year flows elevation and/or well defined channel sections, the solution is retention/detention ahead of culvert and design the culvert as the principal outlet/spillway to release that flow that will maintain the integrity of the stream.

Response: The purpose of the bankfull design requirement is to prevent erosion of the upstream and down stream channel sections at the inlet and outlets ends of the conduit during small, channel forming storm events so that fish passage through the culvert is possible. This criterion is not intended to provide upstream flood relief by allowing the installation of a larger sized culvert to pass more flow.

End Treatments, Outlet Protection, and Level Spreaders

Comment 51

(Sierra Club) Section 2.3.4 – 2.3.6: End Treatments (66-74): This section combines with the following two covering protection from erosion at outlets and outfalls. This section should state explicitly that stormwater conveyances should not discharge in such a way as to accelerate erosion. Ideally, end treatments would include biological systems as well as engineered physical structures.

Response: The erosion control measures at pipe outfalls referenced in these sections are for transitions from constructed infrastructure (pipes) to existing “natural” systems where the flow velocities that “natural” systems can tolerate are exceeded.

Comment 52

(Sierra Club) In Section 2.3.5 requiring channel protection, it is not clear if this is the channel of the receiving stream.

Response: The Manual has been revised to clarify that channel protection criteria specified in this section apply to constructed channels and existing, natural receiving streams during the design storm event.

Comment 53

(Domenico Milillo) Page 66 Section 2.3.5.2 - It would be most important if the rock sizes of 1,2,3,and 4, and A, B, C be assigned the more acceptable hydraulic codes of R(#s).

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Response: Rock sizes are presented as Type A, B, C, and D to be consistent with the nomenclature in the City Construction and Material Specifications.

Comment 54

(Domenico Milillo) Page 69 - Riprap Outlet Basins, HEC14 is excellent source for this. Baffled Outlets, Design of Small Canal Structures is, also, excellent. There are 10 Baffled Outlet sections that compliment the figure 2-13 on Page 71. My recollection on this subject is that the maximum exit velocity is <30 fps and Qs up to 339cfs. Also, the best design is achieved under conditions that the $T_w=(b/2+f)$ and T_w should never exceed $(b+f)$. Stilling Basins must also use designs in Design of Small Canal Structures. Another Energy Dissipater is Stilling Well.

Response: References to the Federal Highway Administration's Hydraulic Engineering Circular (HEC) No. 14, Hydraulic Design of Energy Dissipaters for Culverts and Channels and the U.S. Department of the Interior, Bureau of Reclamation's Design of Small Canal Structures have been added to the Manual.

Comment 55

(Domenico Milillo) Page 72 Level Spreaders - This entire section needs complete revision. Level spreaders are classified as earthen and structural level spreaders. Earthen level spreaders are normally used where diversion ditches or dikes outlet onto areas of established vegetation. They are not to be used below sediment traps, sediment basins, or stormwater pipes. These are the kind shown in Fig.2-14, and mainly used in erosion and sedimentation control plans. The maximum discharge is 1 cfs per foot of length based on peak rate flow from a ten (10) year frequency rainfall event. $L_{min}=5$ feet, $L_{max}=25$ feet. Thus, very limited and used in E/S controls. Structural level spreaders are usually individually designed to accommodate specific site conditions. These types of spreaders may be used below sediment traps, sediment basins, or stormwater pipes. Structural level spreaders are often desirable where basins discharge to wetlands, to encourage sheet flow rather than channel flow to the wetlands.

To avoid re-concentrating flow downstream of the spreader, the maximum distance from a spreader to an existing or constructed defined drainage way is 100 feet with a 5% maximum slope unless very uniform and very stable site conditions exist. I would use this where quality control is important, low flows, and slopes under 5%. Otherwise, the use of Riprap Aprons should suffice.

Response: This section has been revised to provide design guidance and references (i.e. Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement, prepared for the Illinois EPA by Illinois NRCS; and Ohio Rainwater and Land Development Manual, Second Edition 1996; NRCS Design Note 24, Guide for Use of Geotextiles) specific to structural level spreaders. The Manual has also been revised to state that overland flow lengths between level spreaders and receiving concentrated flow

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conveyance systems are limited to the overland flow lengths specified in the time of concentration requirements at the beginning of Section 2.

Constructed Open Channels and Major Stormwater Routing Systems

Comment 56

(*Fuller, Mossbarger, Scott, and May*) Page 75, 1st para – Add “...shall be designed and constructed based on bankfull discharge and once vegetative cover is established able to withstand...” Natural channel design is not based on the 100-year event, but does take it into account.

Response: The stream restoration requirements previously included in Section 2.3.7 have been removed to avoid confusion with the design requirements for constructed open channels. The stream restoration requirements provided in Section 1 as they apply to the restoration of areas disturbed by permitted activities have been revised to require designs to be based on bankfull discharge of the stream.

Comment 57

(*Domenico Milillo*) Page 75 Section 2.3.7.1:

- a. Channel Hydraulic Requirements, Design Storm Frequency - I am confused on the 5 year design vs. the 10 year design for widths and depths of channel.
- b. Cross Section Shape - Why only two geometric shapes? Rectangular and triangular are good geometric shapes of channel sections. The parabolic section is extremely difficult to achieve with heavy equipments, although after the semicircular section it offers the best hydraulic conditions.

(*Sierra Club*) Section 5.2.7: Stormwater Detention Calculations (151): Two: If the constructed open watercourse is designed to convey a 5 year storm (150), but the maximum release rate is for a 10 year storm, won't erosion result?

Response: The 10-year/5-year criterion was originally proposed for adoption to maintain consistency with the same criteria presented in ODOT's Layout and Design Manual, Volume II. After further consultation with ODOT about the use of this criteria, the Manual has been revised to require that both channel capacity and maximum velocity calculations be based on the 10-year storm event. Trapezoidal and parabolic channel shapes were selected because their channel banks are more inherently stable, they are easier to mow and maintain, and they offer greater hydraulic efficiencies as compared to rectangular or triangular channel designs.

Comment 58

(*Sierra Club*) Section 2.4: Design of Major Stormwater Routing Systems (78-79) - The definitions of major and minor drainage systems on page 6 are excellent and could be

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summarized in the text. They suggest that minor systems generally carry up to 5 year storms?

Response: Minor conveyance systems are designed to convey flows from varying return intervals, not just the 5-year event. Reference to the 5-year event in the definition of minor conveyance systems has been removed to avoid misinterpretation. Reference to the capacity of minor systems in this discussion is made to inform the designer that, during preliminary evaluations, the portion of the major storm event that will be conveyed within the minor conveyance system (which is equal to the design capacity of the minor system) can be deducted from the total flow amount generated during the major event. This reduces the amount of flow that must be safely conveyed overland through the site during major storm event.

Water Quantity Controls

Comment 59

(Oxbow River and Stream Restoration, Inc.) All requirements in Zoning Code 3372.707 should be explained in the CSDM.

(Sierra Club, The Nature Conservancy, Central Ohio Watershed Council, Franklin Soil and Water Conservation District) Incorporate Stricter Quality Controls Where They Exist. - This report does not mention TMDL standards. It makes sense to incorporate them where they exist in an inclusive statement. The Big Darby watershed will have stricter water quality controls implemented by Ohio EPA. Specific reference and inclusion should be in this ordinance, implementing any controls for Big Darby environmentally sensitive areas.

Response: It is beyond the scope of the Manual to attempt to duplicate language that is already provided in the City's zoning code. The Introduction of the Manual has been revised to acknowledge that more stringent stormwater standards adopted by the Ohio EPA or the City to protect sensitive ecological areas or meet the goals of Total Maximum Daily Loads may apply. Where alternative standards conflict with the requirements of the Manual, the more stringent criteria shall apply.

Comment 60

(Sierra Club) Examine Volume v. Peak Flow Calculations - The stormwater regulations are based on peak flow rates and not volumes. We support controls on calculated increase of post-development volumes.

Stormwater quantity controls should, in our view, have controls or limits on increase in runoff volumes – with disincentives to increase runoff volume over pre-development conditions.

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Response: Volume control is largely a product of LID (Low Impact Design) techniques that rely primarily on infiltration practices that have as yet to be proven to work in most common Central Ohio soils. The City may consider the adoption of LID techniques at a future date as evidence of successful implementation becomes available in climates and soil conditions similar to Central Ohio. Currently the Ohio EPA WQv criteria and Critical Storm criteria provide significant peak flow controls to account for increased volumes.

Comment 61

(Columbus Regional Airport Authority) Clarify what is meant by “immediately downstream of the development” and “flood-prone areas” in the following statement on Page 83: “The Administrator or his designee reserves the right to require stormwater controls if it is determined that flood control benefits can be achieved in known flood prone areas immediately downstream of the development.”

Response: The Manual has been revised to clarify that The Administrator, or the Administrator’s designee, reserves the right to require more stringent stormwater controls if it is determined that flood control benefits can be achieved in downstream portions of the watershed where flooding problems have been identified as existing prior to the proposed development.

Comment 62

(Sierra Club) Section 3.2.1: Stormwater Quantity Control Exemptions (82): Three: The existing facility should be functioning up to the level required by these regulations.

Response: It is probable that some existing regional detention facilities may have been constructed well before the adoption of the Manual and designed under existing guidelines at the time. It is often neither appropriate nor practical to require that an existing facility be reconstructed or deemed unusable because regulations changed at a later date.

Comment 63

(Sierra Club) Section 3.2.2: Hydrologic Requirements (82-83): Quantity control calculations are based on the Critical Storm Method, referenced to Mid-Ohio Regional Planning Commission in 1977. Although this will provide protection from peak flows, there will be much longer periods of the maximum flow allowed. Is there not another more recent method developed since 1977?

Response: Even though the Critical Storm Method was developed in 1977, it is still an effective means of providing flood control and minimizing streambank erosion. The City considers its application to provide more flood control and stream protection benefits than merely controlling stormwater runoff from post development to predevelopment conditions as is still specified in many stormwater guidance documents that were reviewed in the preparation of the Manual. The Mid-Ohio Regional Planning Commission Stormwater

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Design Manual, 1977, states that the critical storm method was developed to: 1) minimize the effect of coincidental peak discharges in the receiving stream channel from different developments located throughout the watershed and 2) minimize erosive stresses on streambanks by controlling the discharge of more frequent storm events. In addition to adopting the Critical Storm criteria, runoff must also be restricted to meet the Ohio EPA/ODNR-based water quality volume and drawdown requirements developed to remove stormwater pollutants and minimize erosive stresses on streambanks.

Comment 64

(The Building Industry Association of Central Ohio) Detention basins are required to be provided with an emergency drain. However, many ponds have outlets well above the bottom of the pond, without these areas having adequate fall to a gravity outlet. It is our opinion that a portable pump can be used if a pond needs drained which will be a very rare occasion.

Response: Section 3 has been revised to propose emergency drains as a recommendation to enhance dewatering and no longer makes an emergency drain a mandatory feature. Applicants must fully describe the protocol for pumping the pond out in their maintenance plans.

Comment 65

(Sierra Club) Section 3.2.4.1: General Requirements for All Detention Basins (84-86): Why is woody vegetation not permitted? With no shade, basins will increase water temperatures.

Adapt Engineering Practices so that Hydrology and Temperature are Protected. - The BMPs required will allow alterations of stream flow hydrology and water temperature. Adding woody plant species for shade would help maintain cooler temperatures. Maintaining water flow during dry periods might be helped by generous woodland riparian buffers.

Response: The prohibition is intended to apply to constructed embankments or levees. ODNR dam safety regulations do not allow trees/brush on constructed embankments because the structural integrity of the embankment could be compromised if:

1. a tree is blown down and embankment material is removed with the rootball, or
2. a tree dies leaving a decaying root path that will allow water to seep through the embankment and possibly create conditions for embankment failure.

Language has been added to Section 3 encouraging the use of woody vegetation around the basin, but outside embankment/levee areas, to control water temperatures within the basin.

Comment 66

(EMH&T) Section 3.2.4.1, page 84, item 3): it is unclear whether it is permissible to have a designed emergency spillway that operates for events less than the 100-year event. If that is

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not permissible, then it may become necessary to over-detain within the stormwater management facility when it is outletting directly to a downstream storm sewer system with a capacity less than the 10-year design storm. If it is permissible, we suggest some clarification that would elaborate on the requirements for the capacity of the receiving stormwater system when an emergency spillway will be operating for storm events less than to the 100-year (e.g., in the case of a downstream storm sewer, ensuring that there is sufficient flood routing capacity).

Response: Per Section 3, the detention basin must be designed to release no more than the 10-year predeveloped flow amount during a 100-year event. If downstream analysis (Section 2) indicates that downstream watersurface elevations (along either enclosed, open, or overland/flood routing systems) will increase as a result of the proposed development, then additional detention and/or changes to the site to reduce runoff volumes will be required.

Comment 67

(*EMH&T*) Section 3.2.4.1, page 85: (regarding Table 3-2) although requiring freeboard for a detention embankment provides a preferred factor of safety, we suggest an allowance that would not require the 1.0 foot freeboard for a detention basin where the basin outlets “directly” to a Tier I/II stream (where overtopping would have no immediate effect). This would reduce the amount of floodplain loss compensation that may be required under these circumstances. Regardless, we suggest that there be a requirement for the elevation of the adjacent structures to be higher than the elevation of the embankment.

Response: The City agrees with this recommendation. Section 3 (footnote under Table 3-2) has been revised to waive the 1-foot freeboard requirements for detention facilities discharging directly into Tier I and Tier II streams and require that the first floor elevations adjacent to the basin be located at least 1 foot higher than the basin embankment.

Comment 68

(*The Building Industry Association of Central Ohio*) The requirement for a paved low flow channel in bottom of the basin regardless of the slope is contradictory to design needs for providing post-construction water quality. Clearly, this contradiction needs to be resolved prior to publication of the final manual.

Response: The requirement for a paved low flow channel to enhance maintenance does not contradict design needs for water quality. The paved low flow channel allows for more efficient removal of settled solids from the basin with a loader bucket or similar. Scraping solids from a concrete invert reduces maintenance time and prevents the re-suspension of settle solids that is often associated with dredging soil-bottomed channels. Recent discussion with Ohio EPA verified that the requirement for a paved low flow channel within dry detention basins to enhance maintenance does not prevent or impair the facility from performing its intended water quality function.

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Comment 69

(The Building Industry Association of Central Ohio) Many basins are used for both temporary sedimentation control as well as permanent stormwater detention / water quality. Therefore, the statement that the “flow shall be diverted around the basin until at least 75 % of the vegetation has become established” is inconsistent with this. Our industry needs to be able to use dry basins as a sediment basins during construction and before grass is established.

Response: The Manual has been revised to remove the requirement for stormwater diversions around basins that are to be used as temporary erosion and sediment control devices during construction. Text has been added, however, that will require the temporary basins to be cleaned of accumulated sediment, fitted with a permanent outlet control structure, and established with vegetation before final acceptance by the City can be given.

Comment 70

(The Building Industry Association of Central Ohio) We don’t understand the limitation of the depth of basin shall be no more than 12 feet deep. Our industry needs the ability to go as deep as the soils will allow in some situations to provide fill material for the project.

Response: Permanent pools deeper than 12 feet may thermally stratify, creating an anoxic zone in deep areas with low dissolved oxygen levels. The City may allow deeper ponds that are to be privately maintained on a case-by-case basis.

Comment 71

(The Building Industry Association of Central Ohio) We strongly believe that the 15 foot “aquatic bench that promotes aquatic vegetation” requirement is inappropriate for most if not all retention / water quality facilities. This requirement will require a significant amount of space, increase maintenance, and create a cattail mess that will prevent anyone from seeing the pond.

Response: The aquatic bench is a feature that promotes water quality within detention ponds by supporting vegetation and increasing nutrient removal. Aquatic benches also provide habitat for mosquito-feeding species, and increases safety from drowning by limiting access to the pond perimeter.

Comment 72

(Sierra Club) Section 3.2.4.2: Additional Layout Requirements for Dry Detention Basins (87-88) - There should be guidelines and a list of recommended species for dry detention basins. Guidelines could include native vegetation that can survive 48 hours saturation and species could include grasses and sedges. As written, there is not sufficient guidance on what the City finds “suitable.”

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Section 3.2.4.3: Additional Requirements for Wet Detention Basins (88-90):

- a. Three: The manual should say that plantings may be selected from Appendix B, and that other native non-invasive shallow emergents may work.
- b. Five: Should say that species may be selected from Appendix B, but that other native non-invasive species that can withstand inundation may work. There needs to be guidance on what the City considers “suitable.”

Appendix B: Approved Vegetation List for Extended Wet Detention Ponds, Stormwater Wetlands, and Bioretention Basins - Good list but restricted, could be expanded. A planting list of recommended species for each control is recommended, see Portland Stormwater Management Manual. Should not be exclusive list; other species could be used. Articulate guidelines, for instance: utilize site-adapted natives and not alien/introduced species; do not use invasives. See Portland Manual.

We hope that more woody species of trees and shrubs can be added. Appendix B lists plants for 3 environments: mudflats, shallow water, and open water. How do these correlate with the controls? The list would be more useful if it said clearly, for example, that shallow water emergents can be sited on the aquatic bench of a wet detention basin or that mudflat species can be used in a wet detention basin above the permanent pool.

It would be useful to suggest wetland status for each grouping, e.g.: mudflats mostly facultative and facultative wetland species; shallow water facultative wetland and obligate wetland species; open water obligate wetland species. See USFW Wetland manual; Floristic Quality Index for Ohio.

(Sierra Club, Central Ohio Watershed Council) Add Landscaping Guidelines - There is a lack of landscaping principles and guidelines: plant selection, soils, mulch, irrigation, site preparation and grading, etc. For examples, see Georgia Stormwater Management Manual; City of Portland Stormwater Management Manual; Prince George’s County Bioretention Manual in the list of references at the end of these comments. Well constructed guidelines can guide efforts, for example, even if not every plant species is on the recommended list. Plant selection guidelines are commonly for species native to eastern North America (or a state) that are adapted to site conditions and will not become invasive.

Appendix B (Approved Wetland List for Detention Ponds...) is a good start and could be expanded. At the very least, the list should be “Recommended Plants.” It should be clear that the list is not exclusive and other species that conform to guiding principles would be approved. Ideally there should be separate lists for each stormwater control situation.

Response: The list of acceptable plant species originally provided in Appendix B as part of the June 2005 draft Manual has been replaced with a revised list of acceptable native species developed by the City’s Recreation and Parks Department with generous assistance of other outside stakeholders (Thank You!). The native species list has been incorporated in Appendix B to serve as a planting guide for the best management practices that are presented in the Manual. The Manual has been revised to remove the term “suitable”.

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Comment 73

(*Sierra Club*) Section 3.2.4.3: Additional Requirements for Wet Detention Basins (88-90):
Six: What other alternatives are suggested near airports?

This regulation will prohibit wet basins from almost two miles of airports.

Response: The restriction pertaining to the location of wet detention basins and stormwater wetlands near airports has been revised. The Manual now states that wet detention basins and wetlands located within 10,000 feet of public-use airports (i.e., a publicly or privately owned airport open to public use) serving turbine-powered aircraft, or 5,000 feet from public-use airports serving piston-powered aircraft is not recommended. This recommendation is based on information presented in the Federal Aviation Administration's, Advisory Circular Number 150/5200-33. As an alternative, dry detention facilities and green roofs are stormwater best management practices that do not maintain a permanent pool of water and are not as likely to attract large numbers of waterfowl.

Comment 74

(*Domenico Milillo*) The green roof technologies I would refrain from using. You may end-up with more problems than it is worth (i.e. structural).

Response: It has been demonstrated that green roofs are capable of providing significant stormwater volume reduction and temperature control for stormwater discharges. Green roof technology may be a practical stormwater control alternative for small redevelopment projects where space is too restrictive for other stormwater controls.

Comment 75

(*Sierra Club, Central Ohio Watershed Council, Mid-Ohio Regional Planning Commission*)
Section 3.2.7: Green Roof Technologies (91):

- a. The requirements for green roofs are much stricter than other stormwater controls; this will not encourage their adoption and use. For instance, there should be system components and maintenance requirements for other controls that are as precise and strict: written maintenance requirements for inspection, aesthetics, debris and litter, and vegetation for basins, filters, etc. We do not understand or support the requirement for retaining at least 50% of precipitation per year. Such a requirement seems arbitrary. If the requirement is retained, green roofs meeting the regulations should get a corresponding stormwater fee reduction.
- b. There should be a list of green roof suggested species and guidelines; see Portland Stormwater Management Manual.

Response: The "50% criteria" is based on typical green roof performance, and is actually a smaller criteria than the WQv (i.e., retaining approximately 0.5 in/event should meet the 50%

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requirement). It should also be noted that the requirement is 50% of the annual rainfall volume, not 50% volume of every storm event. Green roofs are a viable alternative to detention for stormwater quantity and are an alternative to meet criteria for stormwater quality control for redevelopment projects. Credits or incentives for specific controls may be considered at a later date but will not be addressed as part of the Manual. It should be recognized that green roof technology in the Central Ohio area is new and undeveloped. While this Manual allows the use of greenroofs, it is not intended to serve as an authority on this technology. It is anticipated that future revisions to the Manual may include more detailed information as local criteria and standards are developed for green roofs.

Comment 76

(Mid-Ohio Regional Planning Commission) Also, it is suggested that the Recommended Guidelines for Green Roofs (all Canadian and US guidelines are based on these) be referenced in the Manual:

<http://www.roofmeadow.com/FLL.html>

Response: A reference to the Guidelines for the Planning, Execution, and Upkeep of Green-Roof Sites, 2002 developed by the Research Society for Landscape Development and Landscape Design has been added to Section 3. This reference includes the FLL guidelines.

Comment 77

(Central Ohio Watershed Council) Other alternative techniques to stormwater controls should be given serious discussion. A variety of new technologies are emerging to help dampen excess stormwater effects such as bioswales in parking lots, use of porous pavement, cistern and rain barrel storage of roof water. These additional technologies are becoming a more significant part of some municipality's strategy to manage stormwater flows. Now is the time to acknowledge these techniques and encourage implementation.

Response: The City has incorporated technologies with recognized design criteria, proven water quantity and quality control effectiveness, and known application for development projects, including bioswales (called bioretention in the Manual). The City may accept alternative technologies as they become more prevalent in use and are proven to have equivalent effectiveness.

Water Quality Controls

Comment 78

(Sierra Club) Section 3.3: Stormwater Quality Controls (94): This section should list pollutants of concern. There are no performance standards that must be attained. We suggest at least limits on sediment and oil and grease. See Dane County Wisconsin Stormwater Control Plan and Portland Stormwater Management Manual.

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(Friends of Alum Creek and Tributaries, FWSCD) The manual could include more protection from floatable trash, litter and debris coming from paved surfaces. New construction stormwater infrastructure should feature trash inlet filters, catch baskets or other devices. During re-construction on roads and other areas, similar controls should also be added whenever possible as retrofit upgrades.

Response: The water quality criteria presented in the Manual are based on the criteria presented in Ohio EPA's Construction General Permit for stormwater discharges. The design criteria specified in the Construction General Permit is targeted toward the removal of total suspended solids. Many of the BMPs presented in the Manual are required to be designed to capture floatables such as oil, grease, and floatable solids. The City has extensive non-structural floatable and trash control best management practices for its sewer systems that include trash pick-up, leaf pick-up, and streetsweeping programs. These controls are described in the City's Ohio EPA approved Combined Sewer System Operation and Maintenance Manual (CSSOMMP) (April 2005) and are applicable beyond the combined areas. Additional controls on stormwater catch basins create significant maintenance costs and added flooding problems and are, therefore, not required by the Manual.

Comment 79

(Sierra Club) Section 3.3.1.1: Stormwater Quality Control Exemptions (95) - Existing BMPs or management facilities must be functioning to provide the level of control required if they are to have an exemption.

Response: In lieu of the stormwater quality control exemptions and redevelopment variances provided in the June, 2005 draft Manual, reference to Ohio EPA's Construction General Permit and associated Question & Answer document have been added. This was done to ensure consistency between the exemptions and variances prescribed in the Manual and those presented in Ohio EPA's Construction General Permit. Any existing facility proposed to serve as a water quality best management practice for a new development site must indeed be functioning before the City will grant approval for its use.

Comment 80

(The Building Industry Association of Central Ohio) What is a mosquito inspection and abatement plan?

Response: A mosquito inspection and abatement plan is a component of the maintenance plan that describes the design features that are incorporated into stormwater control facilities and proposed maintenance activities that will be undertaken to control mosquito populations.

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Comment 81

(The Building Industry Association of Central Ohio) Section 3.3.3 - There are several requirements within this document that appear to be contradictory to those being applied by Ohio EPA in their enforcement of the post-construction water quality as part of the NPDES Phase II. What input and signoff has the City obtained from Ohio EPA to ensure that interpretation of and enforcement of existing state regulations and proposed City regulations will be consistent? What will our members be expected to do when confronted with conflicting regulatory positions.

Some examples where the City's new policy seems to contradict the Ohio EPA policy:

- a. Section 3.3.3 Stormwater Quality Control - Ohio EPA accepts mechanical treatments for sites less than 5 acres, and wants wet/dry ponds for anything above this. Columbus wants wet ponds only if they have greater than 20 acres of drainage area, dry basins if the drainage area is greater than 10 acres, and media filters and vegetated swales for areas less than 5 acres. First, what do you do in Columbus for something between 5 and 10 acres? Not addressed in Table 3.6. If a developer wants to build a lake with a 15 acre drainage shed, Ohio EPA will accept, and Columbus apparently won't.
- b. Section 3.3.5.1 Bioretention Facilities - Columbus' new policy indicates that you can provide water quality before sending the stormwater to a detention basin. However, Ohio EPA has interpreted the regulations differently, requiring that any "commingling" of the major flood flows and the water quality flows in a basin, even if done after the initial water quality basin, must also provide for stormwater quality within the detention facility.
- c. Section 3.3.8 Applicant-Proposed Stormwater Controls - The new policy leaves it open for an applicant to use proprietary systems for stormwater quality regardless of drainage area. Ohio EPA only allows these systems for areas between 1 and 5 acres.

(EMH&T) Section 3.3.3: There is some concern regarding possible conflicts between the recommendations in this section of the manual and the post-construction water quality standards enforced by the Ohio EPA.

- a. The manual discourages the use of stormwater basins for sites less than 10 acres of runoff area. The Ohio EPA criteria require a specified water quality draw-down time for sites larger than 5 acres that is typically provided within a detention basin. We suggest clarification on the Ohio EPA mandated draw-down time for sites larger than 5 acres.
- b. A wet detention basin is often preferred in these situations (smaller runoff areas) to permit the lesser required drawdown time (24-hour versus 48-hour for a dry basin) and increase the size of the "water quality" outlet to protect from clogging. Since the minimum drainage area of 20 acres for a wet basin is only a recommendation in the manual, no further clarification may be needed unless there is a minimum required size for the basin outlet.
- c. The manual requires that the development site be divided into individual sub-basins of no more than 5 acres when other recommend water quality controls are preferred. The Ohio EPA will continue to require that the overall site provide for the minimum drawdown times discussed previously. Again, we suggest clarification on the mandated draw-down

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times that must be met by the site regardless of the choice of structural water quality control from the City's manual.

Response: The Ohio EPA's General Permit is considered to set minimum standards for post-construction BMP's. The City is not in full agreement with the General Permit for the primary reason that the Ohio EPA does not address maintenance responsibility and allows the developer to do the same. The City cannot avoid its responsibility to rate payers to address the cost for long-term maintenance of all BMP's. In an effort promote consistency with Ohio EPA's Construction General Permit, the Manual has been revised to present the minimum drainage area information in Section 3 as guidelines as opposed stringent minimum standards. While the Construction General permit does not specifically address more detailed BMP performance/maintenance issues like orifice clogging, maintenance of permanent pools, etc. the City still feels that designers should be aware of these considerations when post construction BMPs are being considered. Stormwater control practices may be utilized to serve areas smaller or larger than the recommended criteria but applicants must demonstrate that such facilities will maintain permanent pools, if applicable, and will not be prone to orifice clogging, or result in significant flooding or structural failure during larger storm events.

The City discussed these comments with Ohio EPA on October 4, 2005 and confirmed the following:

- a. Ohio EPA confirmed that proprietary systems are acceptable on areas greater than 5 acres as long as they can meet the capture volume and drawdown times specified in the Construction General Permit.
- b. Ohio EPA confirmed that runoff, captured and treated in water quality control facilities that meet the minimum volume and drawdown times, does not need to be re-captured and treated within a downstream flood control facility during major storm events to meet the conditions of the Construction General Permit.
- c. Ohio EPA confirmed that the requirements of the Construction General Permit will be met if smaller onsite subareas (<5 acres) are captured with BMPs that meet the WQv and drawdown time requirements stipulated in the Construction General Permit.
- d. Ohio EPA confirmed that the City's proposal to apply the water quality flow-through criteria (presented in section 3.3.6 in the June, 2005 draft of the Manual) to areas equal to or greater than five acres in size did not meet the conditions of the Construction General Permit. The City has since revised the Manual to only allow the application of the flow-through criteria to areas less than five acres.

Comment 82

(Oxbow River and Stream Restoration, Inc.) Incorporate the Distributed Runoff Control Method (DRC) into the new regulations. Develop, quantify, and verify the Channel Protection Criteria. Post development peaks and duration must meet a "channel protection criteria". Projects should demonstrate that the post development basin discharge does not alter the sediment transport regime.

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Response: Ohio EPA and Ohio DNR developed the water quality volume and associated drawdown times for BMPs to remove pollutants from stormwater runoff, to reduce streambank erosion, and to provide controls for channel forming flows.

Comment 83

(Domenico Milillo) Section 3.3.2. - The Runoff coefficient equation is different than the one which is used in the Maryland's Manual. Using each equation, I find a discrepancy in the final value. A recent project had a $C=0.867$ using the Maryland equation, whereas using this manual's equation I get a $C=0.684$.

Response: The runoff coefficients provided for the water quality determination in the Manual are based on the values required for use in Ohio EPA's Construction General Permit for stormwater discharges.

Comment 84

(Sierra Club) Section 3.3.4.2: Extended Wet Detention Basins (106-110):

- a. Five: The requirements suggest using salt tolerant plants. Why is this factor for extended wet detention basins but not for quantity controls? Presumably, they would get as much road salt.
- b. Appendix B species do not seem to be selected for salt tolerance. There should be a list of salt-tolerant species.

Response: The requirement for salt tolerant plants in facilities that are expected to serve areas that are likely to be treated with deicing materials has been added to the basin requirements for water quantity controls. The new native species list provided in Appendix B now specifies which plant are salt tolerant.

Comment 85

(Sierra Club) Section 3.3.4.3: Stormwater Wetlands (111-114):

- a. There should be a provision allowing for woody species, trees and shrubs, in wetlands.
- b. Most submittal sites will be less than 20 acres. Is it permissible to allow offsite stormwater into a constructed wetland to meet the requirement for 20 acres of drainage? We hope so: it will reduce total stormwater volumes and allow wetlands to be used in more situations.
- c. Same comments on Appendix B: there should be separate dedicated list of recommended plant species for this and each BMP.

Response: Language has been added to Section 3 encouraging the use of woody vegetation around wetland facilities, but outside embankment/levee areas, to control water temperatures within the wetland. The 20-acre minimum requirement was initially proposed to ensure that wetland systems were supplied with enough water to support the wetland plants within them. For consistency with Ohio EPA's Construction General Permit, that has no such restrictions,

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the Manual has been revised to present the 20-acre minimum as a recommendation. Applicants wishing to propose wetland systems for tributary areas less than 20 acres will now be required to demonstrate that enough water will be supplied to support the wetland vegetation. The introduction of runoff from offsite areas is an acceptable means of providing this additional water volume. Under this scenario, the wetland would need to be sized to capture and detain the total water quality volume amount generated by both the onsite and offsite tributary areas. This is due to the fact that the water quality volume generated onsite that requires treatment cannot be segregated from the offsite runoff entering the wetland. A list of acceptable native plant species for use in wetland facilities is now provided in Appendix B.

Comment 86

(*Sierra Club*) Section 3.3.5: Group 2 – Media Filters (114-123): Table 3-8 is a good list, although taken from Maryland (and Georgia) manuals. However, for consistency, we suggest that a list for bioretention facilities be put in Appendix B with lists for other controls. Each list should be carefully constructed to include plants native to eastern North America that will thrive in the particular soil and hydrology conditions but not become invasive.

Response: A list of acceptable native plant species for use in bioretention facilities is now provided in Appendix B.

Comment 87

(*Williams Creek Consulting*) Much of the existing literature [sic for bioretention] was sourced from Prince Georges County in Maryland. Their original design for bioretention required a sand bed/lens and ~ 4 feet of soil. Both have since been determined to be unnecessary. The web links below and PDF I've attached are from the Prince George's County web page. The document is an introduction to the updated stormwater manual with corrections and suggestions. Both the sand bed and the 4 feet of soil are no longer recommended. 2-2.5 feet of soil is all that is recommended. This will greatly reduce cost in both construction and materials, and help make bioretention more cost competitive. This page actually has several good suggestions (tree sizes, plant quantity, use as water quantity control) that I recommend you consider as well for the new manual. Most of the Prince Georges manual is online as well if there are other considerations.

Response: After further review of more current documentation regarding the design of bioretention facilities, including documentation supplied by the comment author, the Manual has been revised to reduce the minimum planting soil depth to 30 inches (2.5 feet).

Comment 88

(*Sierra Club*) Section 3.3.6: Vegetated Swales and Filter Strips (124-129):

- a. We strongly object to the recommendation of reed canary grass (127) (*Phalaris arundinacea*). It has become a dangerous invasive plant of wetlands throughout eastern

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America. It is on many state lists of invasive species as a plant to be controlled before wetland restoration. It absolutely should not be promoted for constructing stormwater facilities. Reed canary grass was number 1 species of concern on the Invasive Plant Association of Wisconsin survey (www.ipaw.org).

There should be a dedicated list in Appendix B of recommended plants, along with clear guidelines. Although the suggestion here is for fine, close-growing, water-resistant grasses reedtop and reed canary grass are both tall.

- b. The text is very confusing in that it seems to recommend planting according to CMSC Section 659 and later says that those same lists should not be used. The remarks for Vegetated Filter Strips are not any more helpful.

(*Williams Creek Consulting*) Page 127 of section 3.3.6.2 under vegetation requirements, Reed Canary Grass (*Phalaris arundinaceae*) is "...highly recommended..." for use in vegetated swales. Reed canary grass is considered a non-native invasive species by both the Ohio Department of Natural Resources (ODNR) and the United States Fish and Wildlife Service (USFWS). Reed Canary Grass should not be recommended and it should be specified NOT to be used. Other grass-like options for substitutions in vegetated swales can be native wild ryes (*Elymus virginicus*, *E. canadensis*, *Leymus triticoides*), fringed brome (*Bromus ciliatus*), and sedges (*Carex* spp). These recommendations are not in conflict with CMSC 659. I've included the web sites to both ODNR and USFWS for more information on Reed Canary Grass as an invasive species.

Response: The new native planting species provided in Appendix B that lists acceptable plant species for water quality BMPs does not include reed canary grass and reference to reed canary grass and reedtop have been removed from the text. The Manual has been revised to remove the discussion of salt tolerance and item 659 of the City's Construction and Material Specifications.

Comment 89

(*Sierra Club*) Section 3.3.7.2: Controls for Redevelopment (133) - In Section 3.3.1.2 the manual outlines variances for stormwater quality controls. It does not make clear there or here in 3.3.7.2 whether stormwater quantity controls are still required. We would urge making explicit that stormwater quantity controls are still required. It might be helpful to add references for information on identifying high-risk pollutant sources, etc.

Response: The Manual has been rewritten to require applicants to be compliant with the redevelopment requirements provided in Ohio EPA's Construction General Permit and associated Question and Answer documentation.

Comment 90

(*Sierra Club*) Section 3.3.8: Applicant-Proposed Stormwater Controls (134-137):

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- a. This section appears to offer the possibility of using other control technologies. It would be useful to include suggestions of references or sources of information.
- b. Calculations of peak post-development runoff are to be calculated the same way as vegetated swales. Swales, however, in 3.3.6 are only recommended for areas less than five acres. What if the drainage area is larger?

Response: The Manual has been revised to provide reference to Protocol for Stormwater Best Management Practice Demonstrations, current edition, developed by The Technology Acceptance Reciprocity Partnership. Applicant-propose stormwater controls that are intended to serve drainage areas larger than 5 acres must be capable of capturing and detaining the water quality volume specified in the Water Quality Volume (WQ_v) Determination section of the Manual.

Comment 91

(Sierra Club) Highlight and Clarify Maintenance Requirements:

- a. Add a chapter summarizing maintenance requirements. Maintenance requirements are scattered in Section 3.3.9 and Appendices E and F. A separate dedicated chapter in the manual should collect and highlight information. The Portland Stormwater Management Manual does a good job in Chapter 3/Operations and Maintenance: Applicability, Plan Submittal Requirements, and Enforcement.

Information on operations and maintenance is very important. We believe that it should be in a separate dedicated chapter. See Portland SDM.

- b. We believe that there should be consequences for failure to operate and maintain. Enforcement actions are buried in the Model Maintenance Agreement in Appendix F, giving the City the right to enter, fix problems, and seek reimbursement. Maintenance requirements should cover private and public facilities. What recourse is there if the City does not keep up maintenance?

Maintenance requirements for City-maintained facilities needs to be addressed. Are they the same as private facilities? What if the City does not maintain the facilities? What recourse then?

- c. It is not clear why the City should offer to maintain privately owned stormwater facilities (Section 3.3.9). If the City takes over maintenance, a substantial fee is necessary to cover ongoing costs. The responsibility for maintaining private facilities could become a large expenditure for ratepayers.

The City offers to take over maintenance of eligible detention basins and constructed wetlands. This responsibility will be costly over many years; we believe that there should be a substantial fee paid to the City for relieving owners of this responsibility.

Response: The Manual has been revised to consolidate maintenance, inspection, and reporting requirements into a separate section. While the City is responsible for maintaining

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post-construction water quality infrastructure on City-owned facilities, discussion of the quality of maintenance performed on City maintained facilities is beyond the scope or purpose of the Manual. The City will maintain only detention facilities constructed for single-family developments, not privately owned facilities. Past experience indicates that many home owners' associations are not capable of providing proper long-term maintenance on flood control facilities (typically detention basins). In order to protect downstream properties from flooding and to ensure that detention basins and constructed wetlands continue to perform their water quality functions, the City has committed to providing maintenance on these facilities that are built according to the criteria in the Manual.

Comment 92

(The Building Industry Association of Central Ohio) It is a concern to the industry that the practical application of having developers record maintenance agreements for the SWQ & SWM infrastructure. It doesn't seem like the enforcement issue and management of the information that the agreement requires to be submitted on an ongoing basis has been thoroughly thought out. It doesn't appear that the application process has been thought through and therefore, compliance will be a moving target - similar to the application of ADA standards. We are concerned that, at this point, the City does not have the capacity and expertise to shoulder the responsibilities with a clear plan of how the program will be implemented and managed.

Maintenance Agreement: It is our opinion that the requirement for a 10 year maintenance bond is extremely expensive and seems inappropriate. Other than "more is better than less" what problem is this issue trying to address? A 1 or 2 year bond is acceptable.

What are the requirements for a "qualified inspector"?

(Sierra Club) Appendix F, Model Maintenance Agreement: What happens ten years after the agreement? Is there still the right of entry and reimbursement?

Response: Maintenance requirements specified in the original maintenance agreement have been removed from Appendix F and incorporated into a separate maintenance, inspection, and reporting section in the Manual. The requirement for applicants to prepare signed maintenance agreements and the term "qualified inspector" have been removed. Applicants are required, however, to submit maintenance plans for privately maintained facilities with their stormwater plan submittals. The City requires the owners of all privately-owned and operated water quality BMP's to provide yearly maintenance inspection reports to the City. Detention basins that will be City-operated will be maintained by the owner of the basin until such time that they are inspected, approved, and accepted by the City. The City will require that a short-term bond be provided for basins during construction to ensure that the basins will be brought into compliance with the construction drawings prior to acceptance by the City. The requirement for a maintenance bond with a specific time period as originally proposed in Appendix has been removed.

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Comment 93

(*Sierra Club*) Section 3.3.10: Stormwater Control Facility Easement and Access (138): The requirement for constructing and maintaining vehicular access will not be environmentally beneficial.

Response: The water quality BMPs presented in the Manual are only effective at removing stormwater pollutants if they are maintained in good working order. Maintenance of these facilities in most instances requires vehicular access. The BMPs will not be environmentally beneficial with regard to water quality treatment if they cannot be maintained.

Erosion and Sediment Control

Comment 94

(*Sierra Club*) Section 3.5: Construction Stormwater Quality Controls (139) - It is good to include the actual regulations, but we suggest that the regulations be updated to be consistent with this manual, which has stricter limits.

Appendix A: Columbus Erosion and Sediment Pollution Control Regulations - For clarity, these regulations should be updated to be consistent with the manual.

(*Franklin Soil and Water Conservation District*) Franklin SWCD has been conducting inspections on SWPPP's and erosion and sediment control BMP's for almost 15 years. It is our experience that bi weekly inspections are critical to obtaining compliance. We would welcome the opportunity to work with the city of Columbus to assist in meeting this goal of bi-weekly inspections.

Biological components are not stressed over technical components. Erosion and sediment controls in Appendix A

(*Central Ohio Watershed Council*) - Columbus should develop an inspection team to work with contractors, county, and state officials to provide real time enforcement of required BMPs. Developing an enforcement staff that are inspecting for compliance proactively would identify Columbus as a community that took enforcement seriously. A task force between appropriate entities to prioritize this task is suggested and the COW Council is willing to participate in task force for this purpose.

Response: Inspection frequency is a function of project size (disturbance area), location and potential for runoff to exit the site. Since most of the larger projects' runoff are made tributary to and controlled through a sediment basin, increased frequency of inspections becomes less important once the basin is constructed. The City staff spends the greatest amount of time on projects in the beginning phase and performs over 200 site inspections per month. Establishing the methods and frequency for erosion and sediment control inspections are outside the scope of this Manual.

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The City intends to revise and update the erosion and sediment control regulations.

Stormwater Report and Plan Preparation

Comment 95

(The Building Industry Association of Central Ohio) Many of the requirements will require our engineers do a more extensive review of the project during the zoning process. This will also require the City to make some judgment calls at this time and commit to specific items regarding a preliminary stormwater management report. Our industry needs the ability to have a preliminary review of these items during the zoning process without spending a lot of time on detail calculations.

Section 6.2 - The process will require the engineer to do about 75% of the final engineering plans before they can submit the stormwater management plan for the 1st review. The engineer needs to receive comments on the SWM report to submit final engineering plans. This process will make the review process longer. We need to have a commitment from the city to review certain items during the zoning process and reduce the requirements for the preliminary SWM report.

The requirements, amount of calculations, and number of projects that must comply are significantly more than what is currently required. What kind of staff is the City going to hire and train to keep up with the work load? What timeframe for review and approvals will the City set for this work?

Response: Information, including calculations, that is to be submitted with the Stormwater Management Report is to coincide with the submission of the construction drawings for the project. The intent of the Stormwater Management Report is to clearly identify to applicants what information needs to be submitted to support the sizes, locations, and types of stormwater facilities that are shown on the construction drawings. The submission of construction plans and the Stormwater Management Report is to occur after the zoning process is complete. In the past, City staff members have met informally with applicants to preliminarily review specific site layouts during the zoning process. The City will continue to work with applicants in this way during the zoning process. The City wishes to keep these preliminary review meetings/submissions informal and flexible and, therefore, is not proposing to formalize this process in Manual.

The City will provide the resources for necessary plan review.

Comment 96

(Franklin Soil and Water Conservation District) Need to include in 5.1:

- a. The total area of the site and area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, Filling, or grading, including off-site borrow areas).
- b. An estimate of the impervious area should be provided.

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- c. An implementation schedule that describes the sequence of major soil disturbing operations and the implementation for erosion and sediment controls to be employed during each operation of the sequence needs to be provided.

Response: The items listed are required to be shown on erosion and sediment control plans in accordance with the City's Erosion and Sediment Control Regulation provided in Appendix A.

Comment 97

(*Sierra Club*) Section 5.1: Stormwater Plan Requirements (147-148): The text here should mention the plan shows all utility lines on the site. The plan should show amount and location of impervious surface proposed.

Response: The Manual has been revised to require that utilities be shown on the Master Drainage Plan and that impervious surfaces are to be shown on the construction plans

Comment 98

(*Sierra Club*) Section 5.2.3: Storm Sewer Calculations (149-150): Five: Does this mean spacing of inlets?

Response: Yes. Pavement spread calculations are performed to determine the distance between inlets along curbed roadways.

General Notes

Comment 99

(*The Building Industry Association of Central Ohio*) In Exhibit B General Notes, there is a note that states, "If the Owner does not maintain the ponding and detention areas, the plan will become void and the city will plug the sewer at the outlet." This is what the agreement and bond is for. How can the city plug the outlet?

Response: Columbus City Code 1145.84 gives the Director the authority to sever privately owned connections into the City's sewer system in cases where the Director feels discharges endanger persons, the City's sewer system, or the environment. The City will continue to reserve the right to exercise this option to ensure that maintenance on a private facility is being performed

Comment 100

(*The Building Industry Association of Central Ohio*) Exhibit B, last General Note - "... The development shall be constructed and field verified prior to any home construction." This needs revised to read "prior to any final occupancies permits". We should not be responsible

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to do a second field verification on the storm basins after all of the home construction is completed. The developer should not be responsible for fixing any problems after all of the homes are constructed.

Response: We agree; however, the City needs to assure that the BMP's can function and that the system will handle the expected design storms. In many cases the basin(s) functions as a sediment trap as part of construction BMP's for erosion and sediment control. The basins and storm sewer system need to be inspected, cleaned of sediment, verified as per plan, and approved prior to the City accepting operation and maintenance responsibilities. In cases where the owner changes hands (e.g. developer sells lots to builders) the new owner should be made responsible; it is not the City's responsibility to do so. The general note referenced in this comment has been revised to require the property owner to perform the necessary as-built surveys to ensure compliance with the construction drawings.

The City will require that, when the original developer requests that the Certificate in Deposit be cancelled once the streets and utilities within the development are complete, \$5,000.00 shall remain in deposit. The remaining deposit amount will be released once the developer has provided an as-built survey and certified that the stormwater control facilities are constructed in accordance with approved lines and grades on the construction drawings and vegetation is established. Should a discrepancy between the plans and constructed grades exist, the discrepancies shall be eliminated by the Owner/Developer as directed by the City of Columbus. The \$5,000.00 bond is commensurate with costs associated with cleaning the basin and storm sewers to bring the basin into compliance for City acceptance if the developer does not wish to do so.